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LEE J. GARY  
W. F. DESMOND  
J. M. PARKER  
C. H. BASSETT  
J. T. CULLINAN

April 15, 1949.

Frost Co.,  
Kenosha,  
Wisconsin.

Attention: Mr. M. C. Frost,  
President.

Dear Mr. Frost:

In accordance with your letter of April 7, we enclose two printed copies of each of the following United States patents:

2,131,509

2,165,622

Very truly yours,

D:s  
encs

Reg. Han

Sept. 27, 1938.

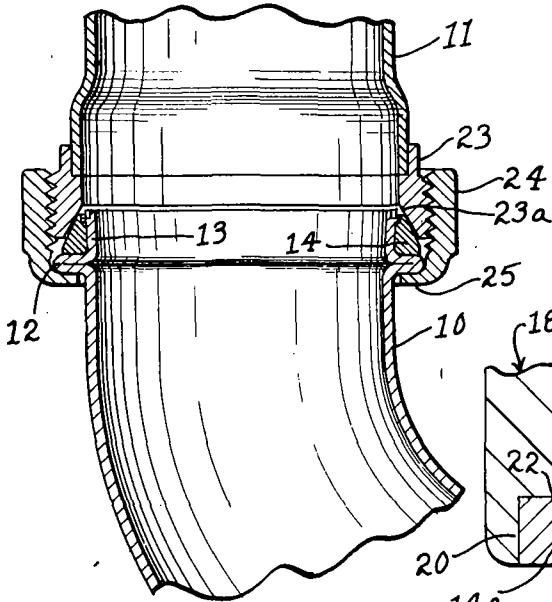
A. H. GOEPEL ET AL

2,131,509

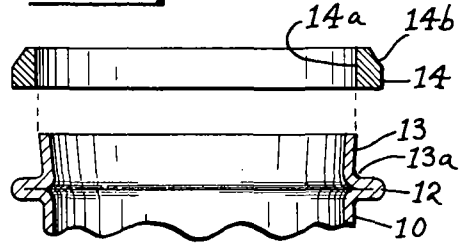
COUPLING CONNECTION FOR PIPE JOINTS AND METHOD OF MAKING SAME

Filed April 22, 1937

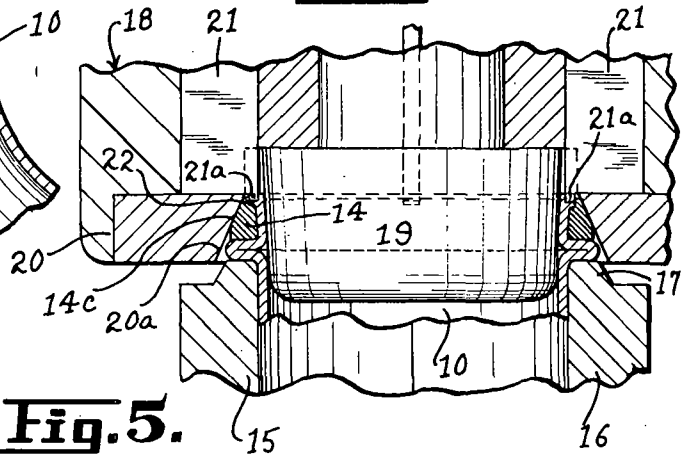
**Fig. 1.**



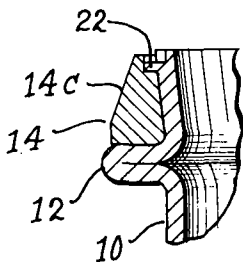
**Fig. 2.**



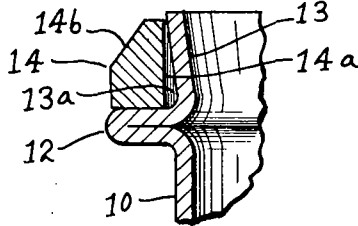
**Fig. 3.**



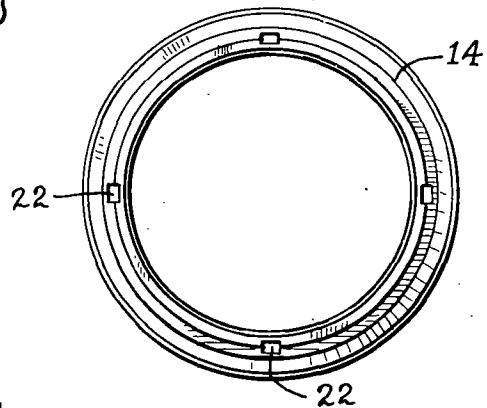
**Fig. 5A.**



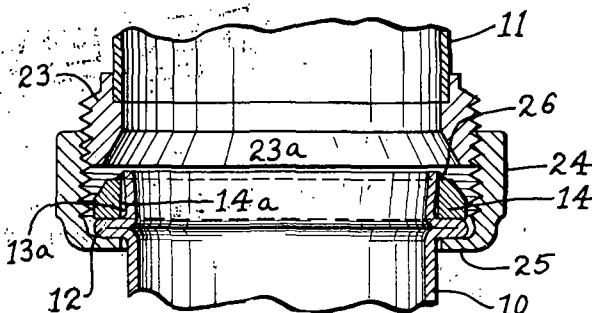
**Fig. 5.**



**Fig. 4.**



**Fig. 6.**



INVENTORS  
**Arthur H. Goepel**  
 BY **Patrick F. Donahue**  
*Harold F. Johnston*  
 ATTORNEY

## UNITED STATES PATENT OFFICE

2,131,509

COUPLING CONNECTION FOR PIPE JOINTS  
AND METHOD OF MAKING SAMEArthur H. Goepel and Patrick F. Donahue,  
Waterbury, Conn.

Application April 22, 1937, Serial No. 138,347

6 Claims. (Cl. 29—157)

This invention relates to pipe couplings, and particularly to the packing element employed in couplings to connect the various types of joints for use with drain, vent, and other connections.

This invention is an improvement over the subject matter disclosed in Patent No. 2,037,625, issued to the same inventors, April 14, 1936.

The essential feature of the present development resides in the improved construction for permanently assembling a sealing washer or gasket to the end of a pipe at a connecting joint, the connection of the washer to the joint end of the pipe being completed in whole or in part at the place of manufacture of the pipe.

A further feature is the particular method employed in assembling the washer to the pipe end, and staking the same in position against rotation relative to the end of a pipe connection. The method of assembly resides particularly in the feature of having one of the pipe joint ends outwardly flared initially constructing the inside diameter of the washer, permitting its assembly over the flared end, and subsequently forcing and compressing the washer by a swaging operation until it closes snugly underneath the flared end of said pipe. This method of assembly not only results in a more economical cost of construction, but also conduces to produce a better sealing element at the pipe joint, as will hereinafter be more fully pointed out.

With these and other objects in view, there have been illustrated on the accompanying drawing two forms in which the invention may be conveniently embodied in practice.

In the drawing:

Fig. 1 represents a vertical sectional view through the union connection between two pipe ends, embodying the principles of the invention.

Fig. 2 is a fragmentary sectional view of one of the pipe ends, showing the relative construction and size of the soft metal sealing washer, with respect to the pipe end in position to be assembled thereupon.

Fig. 3 is a similar view showing the washer in its completed assembled position in association with the tools for producing that operation.

Fig. 4 is a top plan view of the same with the tools removed.

Fig. 5 is a fragmentary enlarged view of one section of the end of the pipe showing the washer in position ready for the forming operation.

Fig. 5A is a similar view to Fig. 5 after the forming operation showing the particular type of staking lug used in the construction.

Fig. 6 is a vertical sectional view of the pipe

connection, showing a modified embodiment of the invention.

Referring now to the drawing, in which like numerals denote corresponding parts throughout the several views, the numeral 10 indicates one of the pipe ends, such as a J-bend, as is used in lavatory or sink connections, and the numeral 11 indicates the other pipe, such as a wall pipe to which the connection is made.

The upper end of the pipe end 10 is formed with an annular bead or flange 12 preferably formed outwardly from the metal wall of said pipe, a short distance below the end thereof, thus leaving a cylindrical neck 13 terminating the end of the tube. The flange 12 and neck 13 serve as a supporting means for a soft metal ring or sealing washer 14 preferably of lead, which is adapted to be assembled permanently at the source of manufacture in a manner herewith described.

As best shown in Fig. 2, the cylindrical neck 13 is flared slightly outwardly, and when taken in conjunction with the flange 12, defines an acute angular circumferential recess 13a thereabout. The sealing washer 14 is initially cast to the design as shown in Fig. 2, wherein the diameter of the inside wall 14a is able to readily slip over the largest diameter at the outermost edge of the cylindrical neck 13. The outside circumferential surface of the washer 14 is formed with a beveled section 14b, at substantially a 45 degree angle, the bevel extending down to about half the thickness of said washer 14.

The manner in which the washer 14 is permanently assembled into place in the preferred embodiment of the invention, and the tools for effecting such an assembly, are best shown in Fig. 3. The J-bend tube 10 or any other tube to which the invention may be applied, is first clamped between a pair of split jaws 15 and 16 which provide a circular anvil 17 at the upper end against which the annular flange of the pipe 13 is adapted to abut as a support. The washer is initially cast, as in Fig. 2, is then disposed upon the flange 12, the relative condition between the parts existing before the final assembly operation being clearly shown in the enlarged view in Fig. 5.

In order to form the washer 14 inwardly underneath the angular recess 13a, previously mentioned, a forming punch, generally indicated by the numeral 18, is provided, having a centering head 19 shaped to conform to the inner taper of the flared neck 13, and a die ring 20. The inner die forming surface 20a of the ring 20 is made at

an angle less than the angle of the beveled surface 14b of the initial cast washer 14, with respect to the axis, so that when the forming punch 18 descends to effect the assembly, the die ring 20 will force and compress the washer 14 radially inwardly against and underneath the flared cylindrical neck 13 in a manner comparable to a swaging operation, and will simultaneously alter the outside contour of the washer 14, in changing the angle of the initial bevel 14b to a less angle from the axis, and will incidentally produce a greater beveled surface area 14c. (See Figures 3 and 5A.)

The above operation is furthermore conducive to changing somewhat the physical characteristics or structure of the washer 14, in that the reforming and compressive forces exerted by the die ring 20 upon the washer 14 will naturally produce a closer grained structure than when the sealing washer was originally cast. It will thus be seen that by so forming the washer, a higher grade sealing element is produced and held in permanent assembly to the end of the pipe, and when so done at the source of manufacture, will thus require no further operation on the part of the tradesmen.

While it is not absolutely necessary, yet if it is desired to make further provision to more securely anchor the washer 14 in position, principally against rotation about the cylindrical neck 13, the striking tool 18 may be provided with one or more spaced cutter plates 21, four in this instance, having relatively blunt projecting shearing prongs 21a at the lower inner ends, the relative position of the prongs 21a in the forming tool being such that they (the prongs 21a) are adapted to strike into about half the metal thickness in the extreme upper annular edge of the cylindrical neck 13, shearing lugs 22 outwardly which embed themselves into the metal at the upper part of the washer 14 in a manner best shown in Fig. 5A.

The pipe 11, to which the union is to be made with the J-bend pipe 10, is required to have an exteriorly threaded bushing 23 secured thereto, which may be effected by a soldering operation. The inner surface of the bushing 23 is formed with a beveled surface 23a for sealing contact with a complementary beveled surface 14c of the washer 14. The pipe 10 is provided with the usual form of interiorly threaded coupling nut 24, the lower end being constructed with an inturned flange 25 for swivelly engaging the lower surface of the bead 12. This coupling nut 24 is adapted to threadedly engage the bushing 12 for coaxially drawing the two pipes 10 and 11 together and effecting a liquid tight seal therebetween by the cooperation of the bushing 23 with the washer 14.

Another feature of this invention resides in the fact that the angle of the interior beveled surface 23a of the bushing 23 is preferably made slightly greater than the angle of the finished beveled surface 14c of the washer 14 so that when the bushing 23 is drawn tightly against the washer 14, the beveled surface 23a of the bushing first engages against the uppermost part of the beveled washer surface 14b, and progressively descends downwardly in proportion to the amount of force that is exerted upon the coupling nut 24 in making the union between the pipes 10 and 11.

In the modified embodiment of the invention, shown in Fig. 6, the construction is identical in all respects to the first form, except that there is no requirement for any tools to complete the assembly of the washer 14 underneath the tubu-

lar flared end 13 of the pipe 10; this assembly, however, being effected at the time the pipes 10 and 11 are joined together upon the first installation. In this modified construction the washer 14, as originally cast, is assembled around the flared end 13 of the pipe 10 resting upon the flange 12, and is so held in place by means of a ring or solder 26 disposed in the angular channel created between the upper adjacent surface of the washer 14 and the flared neck 13. It will be quite evident that when joining the pipes 10 and 11, by screwing up on the nut 24, the beveled surface 23a of the bushing 23 will force the washer 14 inwardly into the recess 13a, and at the same time compressing the washer 14 inwardly and changing the contour of the bevel 14a to more or less correspond with the bevel 23a of the bushing 23, thus effecting a liquid tight seal.

One of the advantages of the present preferred embodiment is that an inherently structurally better sealing washer is provided by reason of the assembly swaging operation, and an improved permanent connection is made between the washer and the end of the tube, with the minimum number of operations.

While there have been disclosed in this specification two forms, it is to be understood that these forms are shown for the purpose of illustration only, and that changes may be made in the described structure without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims.

What is claimed is:

1. The herein described method of fabricating a sealing element at the end of a pipe connection having a slightly flared terminal section and a circumferential flange removed from the end of said pipe, which comprises initially forming a soft metallic washer with an inside diameter sufficiently large to clear the maximum diameter of said flared section, assembling said washer over said flared section to seat upon said flange, swaging said washer inwardly to reform its peripheral surface to a desired contour and drift the metal of the washer solidly underneath said flared portion, and forming lugs out of the upper edge of said pipe into an embedded state with the adjacent edge of said washer simultaneously with the swaging operation.

2. In a sealing joint construction for a coupling connection comprising a tubular pipe, a portion of said pipe adjacent the end being formed with a slight outwardly flared section, an integral outwardly formed flange positioned from the flared end of said pipe, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion said washer being held against relative rotation by means of one or more lugs formed downwardly and outwardly from the annular end of said flared section into an embedded state in the adjacent end of said washer.

3. In a sealing joint construction for a coupling connection comprising a tubular pipe, a portion of said pipe adjacent the end being formed with a slight outwardly flared section, an integral outwardly formed flange positioned from the flared end of said pipe, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion said washer being held against relative rotation by means of one or more lugs sheared downwardly out of substantially one-half of the metal thick-

ness of said flared section into an embedded state into the upper edge of said washer.

5 4. In a sealing joint construction for a coupling connection comprising a tubular pipe, an integral outwardly formed flange on said pipe spaced from the end thereof, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion, said washer being held against movement by means of  
10 one or more lugs sheared downwardly out of substantially one-half of the metal thickness of the outer end of said pipe beyond said flange into an embedded state into the upper edge of said washer.

15 5. The method of forming a pipe joint element from a pipe having an outflaring end portion and an outstanding annular flange at the base of the flare which comprises placing a deformable metal washer on said flange, and permanently deform-

ing the washer in a die to cause the metal thereof to flow against said flange and the outside of the pipe, said deforming simultaneously shaping the outside of the washer with a long taper to engage with a second element of the pipe joint and seal  
5 the joint.

6. As an article of manufacture an element for forming a pipe joint comprising a pipe having an outflaring end portion and an outstanding annular flange at the base of the flare, and a deformable metal washer placed on said flange and permanently deformed in a die to cause the metal thereof to flow against said flange and the outside of the pipe, the outside of the washer being shaped simultaneously by said deforming to provide a  
10 long taper to engage with a second element of the pipe joint and seal the joint. 15

ARTHUR H. GOEPEL.  
PATRICK F. DONAHUE.



## UNITED STATES PATENT OFFICE

2,131,509

COUPLING CONNECTION FOR PIPE JOINTS  
AND METHOD OF MAKING SAMEArthur H. Goepel and Patrick F. Donahue,  
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6 Claims. (Cl. 29—157)

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This invention is an improvement over the subject matter disclosed in Patent No. 2,037,625, issued to the same inventors, April 14, 1936.

The essential feature of the present development resides in the improved construction for permanently assembling a sealing washer or gasket to the end of a pipe at a connecting joint, the connection of the washer to the joint end of the pipe being completed in whole or in part at the place of manufacture of the pipe.

A further feature is the particular method employed in assembling the washer to the pipe end, and staking the same in position against rotation relative to the end of a pipe connection. The method of assembly resides particularly in the feature of having one of the pipe joint ends outwardly flared initially constructing the inside diameter of the washer, permitting its assembly over the flared end, and subsequently forcing and compressing the washer by a swaging operation until it closes snugly underneath the flared end of said pipe. This method of assembly not only results in a more economical cost of construction, but also conduces to produce a better sealing element at the pipe joint, as will hereinafter be more fully pointed out.

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Fig. 3 is a similar view showing the washer in its completed assembled position in association with the tools for producing that operation.

Fig. 4 is a top plan view of the same with the tools removed.

Fig. 5 is a fragmentary enlarged view of one section of the end of the pipe showing the washer in position ready for the forming operation.

Fig. 5A is a similar view to Fig. 5 after the forming operation showing the particular type of staking lug used in the construction.

Fig. 6 is a vertical sectional view of the pipe

connection, showing a modified embodiment of the invention.

Referring now to the drawing, in which like numerals denote corresponding parts throughout the several views, the numeral 10 indicates one of the pipe ends, such as a J-bend, as is used in lavatory or sink connections, and the numeral 11 indicates the other pipe, such as a wall pipe to which the connection is made.

The upper end of the pipe end 10 is formed with an annular bead or flange 12 preferably formed outwardly from the metal wall of said pipe, a short distance below the end thereof, thus leaving a cylindrical neck 13 terminating the end of the tube. The flange 12 and neck 13 serve as a supporting means for a soft metal ring or sealing washer 14 preferably of lead, which is adapted to be assembled permanently at the source of manufacture in a manner herewith described.

As best shown in Fig. 2, the cylindrical neck 13 is flared slightly outwardly, and when taken in conjunction with the flange 12, defines an acute angular circumferential recess 13a thereabout. The sealing washer 14 is initially cast to the design as shown in Fig. 2, wherein the diameter of the inside wall 14a is able to readily slip over the largest diameter at the outermost edge of the cylindrical neck 13. The outside circumferential surface of the washer 14 is formed with a beveled section 14b, at substantially a 45 degree angle; the bevel extending down to about half the thickness of said washer 14.

The manner in which the washer 14 is permanently assembled into place in the preferred embodiment of the invention, and the tools for effecting such an assembly, are best shown in Fig. 3. The J-bend tube 10 or any other tube to which the invention may be applied, is first clamped between a pair of split jaws 15 and 16 which provide a circular anvil 17 at the upper end against which the annular flange of the pipe 13 is adapted to abut as a support. The washer as initially cast, as in Fig. 2, is then disposed upon the flange 12, the relative condition between the parts existing before the final assembly operation being clearly shown in the enlarged view in Fig. 5.

In order to form the washer 14 inwardly underneath the angular recess 13a, previously mentioned, a forming punch, generally indicated by the numeral 18, is provided, having a centering head 19 shaped to conform to the inner taper of the flared neck 13, and a die ring 20. The inner die forming surface 20a of the ring 20 is made at

an angle less than the angle of the beveled surface 14b of the initial cast washer 14, with respect to the axis, so that when the forming punch 18 descends to effect the assembly, the die ring 20 will force and compress the washer 14 radially inwardly against and underneath the flared cylindrical neck 13 in a manner comparable to a swaging operation, and will simultaneously alter the outside contour of the washer 14, in changing the angle of the initial bevel 14b to a less angle from the axis, and will incidentally produce a greater beveled surface area 14c. (See Figures 3 and 5A.)

The above operation is furthermore conducive to changing somewhat the physical characteristics or structure of the washer 14, in that the reforming and compressive forces exerted by the die ring 20 upon the washer 14 will naturally produce a closer grained structure than when the sealing washer was originally cast. It will thus be seen that by so forming the washer, a higher grade sealing element is produced and held in permanent assembly to the end of the pipe, and when so done at the source of manufacture, will thus require no further operation on the part of the tradesmen.

While it is not absolutely necessary, yet if it is desired to make further provision to more securely anchor the washer 14 in position, principally against rotation about the cylindrical neck 13, the striking tool 18 may be provided with one or more spaced cutter plates 21, four in this instance, having relatively blunt projecting shearing prongs 21a at the lower inner ends, the relative position of the prongs 21a in the forming tool being such that they (the prongs 21a) are adapted to strike into about half the metal thickness in the extreme upper annular edge of the cylindrical neck 13, shearing lugs 22 outwardly which embed themselves into the metal at the upper part of the washer 14 in a manner best shown in Fig. 5A.

The pipe 11, to which the union is to be made with the J-bend pipe 10, is required to have an exteriorly threaded bushing 23 secured thereto, which may be effected by a soldering operation. The inner surface of the bushing 23 is formed with a beveled surface 23a for sealing contact with a complementary beveled surface 14c of the washer 14. The pipe 10 is provided with the usual form of interiorly threaded coupling nut 24, the lower end being constructed with an inturned flange 25 for swivelly engaging the lower surface of the bead 12. This coupling nut 24 is adapted to threadedly engage the bushing 12 for coaxially drawing the two pipes 10 and 11 together and effecting a liquid tight seal therebetween by the cooperation of the bushing 23 with the washer 14.

Another feature of this invention resides in the fact that the angle of the interior beveled surface 23a of the bushing 23 is preferably made slightly greater than the angle of the finished beveled surface 14c of the washer 14 so that when the bushing 23 is drawn tightly against the washer 14, the beveled surface 23a of the bushing first engages against the uppermost part of the beveled washer surface 14b, and progressively descends downwardly in proportion to the amount of force that is exerted upon the coupling nut 24 in making the union between the pipes 10 and 11.

In the modified embodiment of the invention, shown in Fig. 6, the construction is identical in all respects to the first form, except that there is no requirement for any tools to complete the assembly of the washer 14 underneath the tubu-

lar flared end 13 of the pipe 10; this assembly, however, being effected at the time the pipes 10 and 11 are joined together upon the first installation. In this modified construction the washer 14, as originally cast, is assembled around the flared end 13 of the pipe 10 resting upon the flange 12, and is so held in place by means of a ring or solder 26 disposed in the angular channel created between the upper adjacent surface of the washer 14 and the flared neck 13. It will be quite evident that when joining the pipes 10 and 11, by screwing up on the nut 24, the beveled surface 23a of the bushing 23 will force the washer 14 inwardly into the recess 13a, and at the same time compressing the washer 14 inwardly and changing the contour of the bevel 14a to more or less correspond with the bevel 23a of the bushing 23, thus effecting a liquid tight seal.

One of the advantages of the present preferred embodiment is that an inherently structurally better sealing washer is provided by reason of the assembly swaging operation, and an improved permanent connection is made between the washer and the end of the tube, with the minimum number of operations.

While there have been disclosed in this specification two forms, it is to be understood that these forms are shown for the purpose of illustration only, and that changes may be made in the described structure without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims.

What is claimed is:

1. The herein described method of fabricating a sealing element at the end of a pipe connection having a slightly flared terminal section and a circumferential flange removed from the end of said pipe, which comprises initially forming a soft metallic washer with an inside diameter sufficiently large to clear the maximum diameter of said flared section, assembling said washer over said flared section to seat upon said flange, swaging said washer inwardly to reform its peripheral surface to a desired contour and drift the metal of the washer solidly underneath said flared portion, and forming lugs out of the upper edge of said pipe into an embedded state with the adjacent edge of said washer simultaneously with the swaging operation.

2. In a sealing joint construction for a coupling connection comprising a tubular pipe, a portion of said pipe adjacent the end being formed with a slight outwardly flared section, an integral outwardly formed flange positioned from the flared end of said pipe, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion said washer being held against relative rotation by means of one or more lugs formed downwardly and outwardly from the annular end of said flared section into an embedded state in the adjacent end of said washer.

3. In a sealing joint construction for a coupling connection comprising a tubular pipe, a portion of said pipe adjacent the end being formed with a slight outwardly flared section, an integral outwardly formed flange positioned from the flared end of said pipe, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion said washer being held against relative rotation by means of one or more lugs sheared downwardly out of substantially one-half of the metal thick-



ness of said flared section into an embedded state into the upper edge of said washer.

4. In a sealing joint construction for a coupling connection comprising a tubular pipe, an integral outwardly formed flange on said pipe spaced from the end thereof, and a metallic packing washer seated upon said flange and tightly embraced about the outside of said tapered portion, said washer being held against movement by means of one or more lugs sheared downwardly out of substantially one-half of the metal thickness of the outer end of said pipe beyond said flange into an embedded state into the upper edge of said washer.

5. The method of forming a pipe joint element from a pipe having an outflaring end portion and an outstanding annular flange at the base of the flare which comprises placing a deformable metal washer on said flange, and permanently deform-

ing the washer in a die to cause the metal thereof to flow against said flange and the outside of the pipe, said deforming simultaneously shaping the outside of the washer with a long taper to engage with a second element of the pipe joint and seal the joint.

6. As an article of manufacture an element for forming a pipe joint comprising a pipe having an outflaring end portion and an outstanding annular flange at the base of the flare, and a deformable metal washer placed on said flange and permanently deformed in a die to cause the metal thereof to flow against said flange and the outside of the pipe, the outside of the washer being shaped simultaneously by said deforming to provide a long taper to engage with a second element of the pipe joint and seal the joint.

ARTHUR H. GOEPEL.  
PATRICK F. DONAHUE.

July 11, 1939.

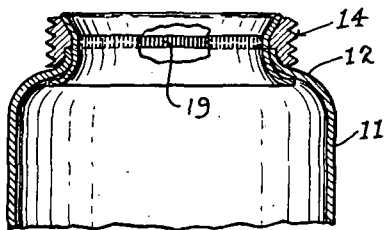
P. F. DONAHUE

2,165,622

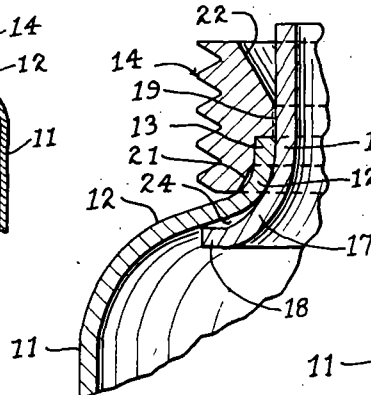
PIPE CONNECTION

Filed May 20, 1938

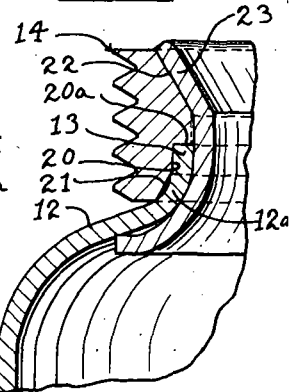
**Fig. 1.**



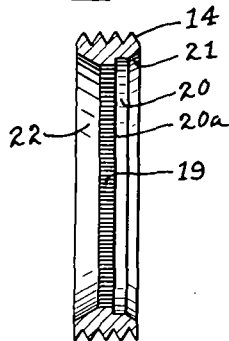
**Fig. 2.**



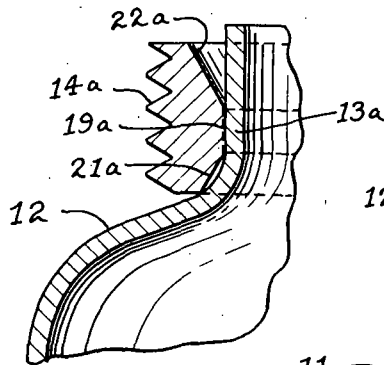
**Fig. 3.**



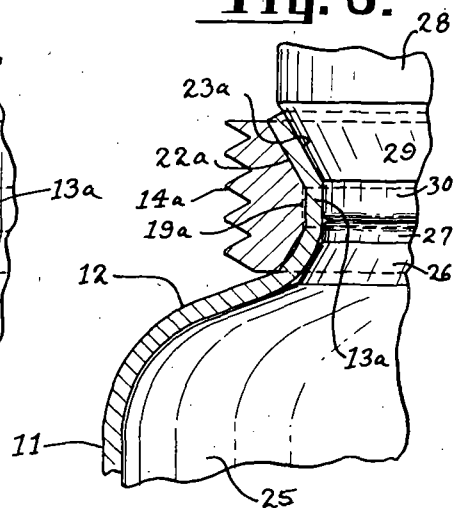
**Fig. 4.**



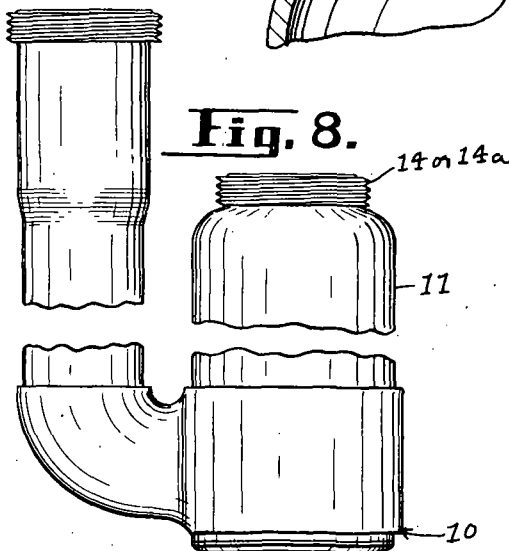
**Fig. 5.**



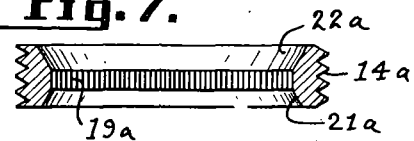
**Fig. 6.**



**Fig. 8.**



**Fig. 7.**



INVENTOR  
**Patrick F. Donahue.**  
BY  
*H. F. Johnston*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,165,622

## PIPE CONNECTION

Patrick F. Donahue, Waterville, Conn., assignor  
to Scovill Manufacturing Company, Water-  
bury, Conn., a corporation of Connecticut

Application May 20, 1938, Serial No. 209,097

6 Claims. (Cl. 285—56)

This invention relates to pipe connections and particularly to attaching permanently and rigidly a threaded bushing to the end of a relatively thin wall tubular member. The invention is intended primarily for improving the construction of the so-called anti-siphon type of trap wherein there is provided a relatively large cylindrical chamber terminating at its upper end in a reduced neck portion to which is attached a threaded bushing for making connection with a lead-in pipe by means of the usual coupling nut.

It is the principal object of this invention to provide a means for attaching a threaded bushing, having sufficient strength and material to accommodate the standard thread, to the reduced neck portion of the trap without the use of solder, in a leak-proof manner and with sufficient gripping force to prevent relative turning of the connected members after once assembled.

A further object is to design the trap joint end and bushing in such a manner that the assembly may be effected by means of tools that may be operated on a punch press or similar machine; that is, to have the setting tools driven axially into the trap joint in making the assembly.

Other objects and advantages will be apparent from a consideration of the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view through one portion of the upper part of a main container of an anti-siphon trap illustrating the improved manner of attaching a threaded bushing thereto.

Fig. 2 is a vertical sectional view of only one section of the bushing connection drawn on an enlarged scale to more intimately show the details of construction as the parts appear before the setting operation.

Fig. 3 is a similar view showing the construction after the setting operation.

Fig. 4 is a vertical sectional view of the threaded bushing.

Fig. 5 is a fragmentary vertical sectional view of a modified form of construction and somewhat simplified over the first form, the view showing the parts before assembly.

Fig. 6 is a similar view as the parts appear after the setting operation, and showing the tools for performing the setting operation.

Fig. 7 is a vertical sectional view of the bushing used in the modified form of construction.

Fig. 8 is a side elevation, in abbreviated form, of an anti-siphon trap embodying the principle of this invention.

Referring now to the drawing wherein like

numerals refer to like parts throughout the several views: numeral 10 refers generally to an anti-siphon trap, one portion of which consists of a relatively large cylindrical chamber 11, made from a drawn shell, the upper end of which is integrally formed into a more or less restricted or converging portion 12 terminating in a short upstanding neck 13, the latter having its walls parallel to the container axis. Since the chamber part 11 of the trap is made from a drawn shell, the stock thickness of the wall of the neck 13 is not sufficient to accommodate the standard thread employed for making such plumbing connections, thus necessitating the use of a bushing member 14 of sufficient stock thickness to take the standard coupling thread 15 for cooperation with a coupling nut (not shown) usually carried on the other pipe to which the union is made with the anti-siphon trap.

A means is provided for permanently attaching the bushing 14 to the chamber 11 in the form of a cylindrical sleeve 16, the lower part of which is formed into a flaring portion 17 and merges into an annular flange 18 disposed in a plane perpendicular to the axis of the sleeve 16. The interior diameter of the bushing member is constructed so as to provide at its intermediate portion a cylindrical surface 19 capable of having a snug fit around the cylindrical sleeve 16. As shown in Figs. 1 and 4 this surface 19 may be roughened preferably by a straight line knurl to assure a better gripping effect between the adjacent members. Immediately below the surface 19, the bushing 14 is formed with a stepped annular groove 20 and defining a shoulder 20a between the groove 20 and surface 19. The lower part of the groove connects with a small beveled section 21 by a relatively sharp angle joint, while the adjacent portion of the neck 13 merges into the converging portion 12 by a radius portion 12a for reasons which will be later explained. Immediately above the cylindrical wall 19, the bushing is formed with a larger beveled section 22, against which the adjacent walls of the sleeve 16 are formed as at 23 to conform with the bevel 22 and provide a suitable connecting joint face or seat to accommodate the complementary face of the connection member (not shown) in making the trap installation.

In the assembly of the device the bushing 14 is first fitted over the neck 13 of the chamber 11 with said neck engaging snugly within the stepped groove 20 for which the latter was purposely designed. The sleeve 16 is then inserted through the larger end of the chamber 11 to a position

where the perpendicular flange 18 abuts against the inside wall of the converging portion 12 of the chamber 11, in a manner as shown in Fig. 2. By resting the converging portion 12 of the chamber 11 and flange 18 of the attaching sleeve 16 upon a suitable anvil disposed within the chamber 11, another tool of suitable shape may be axially forced into the sleeve from the upper end thereof for the purpose of flaring the wall of such sleeve outwardly against the larger beveled section 22 and swell the intermediate part of the sleeve 16 into the knurled surface 19 to interlock the parts together, and incidentally provide for the connecting joint seat 23, previously mentioned.

It will be noted, by inspecting Figs. 2 and 3, that the connection radius 12a of the converging portion 12 of the chamber 11 is different from the radius or particular form of the flared portion 17 of the sleeve 16 so that when the attaching sleeve 16 is assembled in place the result will be a slight opening or clearance 24 between the adjacent walls of sleeve 16 and radius section 12a. The object of this clearance 24 is to assure, in the assembly operation, that the upper edge of the flange 18 will bite or be forced into the metal material of the converging portion 12. At the same time the relatively sharp angular corners where the small beveled section joins the adjacent walls of the bushing 14 will likewise be forced tightly into the metal of the radius portion 12a and thus assuring a leak-proof and a lock-proof connection between the parts on opposite sides of the wall at the upper end of the chamber 11. This biting effect is caused by the manner of assembly wherein the flange 18 rests upon the suitable anvil and the tool employed for beveling the seat 23 being forced axially into the chamber will necessarily jam all the parts tightly together and at the same time force the wall of the connecting sleeve 16 outwardly to grip into the knurled section 19.

As a practical example, the tools that may be employed for accomplishing the assembly of the parts will be given in connection with the description and drawing of the modified form hereinafter disclosed.

The modified form of construction illustrated in Figs. 5, 6, and 7 differs from the first form in that the connecting sleeve 16 is eliminated and in place thereof the cylindrical neck 13a of the chamber 11 is extended considerably in length, and the upper end thereof is flared outwardly against the larger bevel face 22a of the bushing 14a to produce the connecting joint seat 23a. In this construction the annular groove 20 is omitted from the bushing 14a whereby the intermediate surface 19a is increased in width and, if desired, provided with the straight line knurl as in the first form. The smaller beveled face 21a of the bushing 14a connects into the adjacent base surface of the bushing and the surface 19a by a relatively sharp angle joint for the purpose of biting into the metal surface of the connecting radius section 12b when the bushing 14a is assembled in place.

The purpose of having the connecting angle joint on the opposite sides of the small bevel 21 or 21a bite into the adjacent surface of the radius section 12a or 12b in both forms of the construction is to make the joint leak-proof at that portion so as to prevent solution or acids seeping in between the metal surfaces when such matter might lodge in any interstices therebetween and subsequently leak out to weaken the connection and ruin the finish of the article.

The tools by which the bushing may be secured to the neck of the chamber 11 are shown in Fig. 6. Herein an anvil 25 is employed having its upper end shaped in conformity with the converging portion 12 of the chamber 11. The anvil 25 is surmounted with a frustum-conic neck section 26 terminating in a relatively short cylindrical tip 27 that snugly fits the interior diameter of the neck 13a. The anvil is preferably a stationary member and the chamber 11 with the bushing in the state as shown in Fig. 5 is slipped over the top of the anvil 25 with the converging portion 12 resting on the correspondingly shaped portion of the anvil and the interior high point of the radius section 12b engaging the conic section 26.

The punch 28 for upsetting the metal stock of the neck 13a travels in an axial line common with the axis of the chamber 11. The punch 28 is formed with a conic working face 29 terminating in a reduced cylindrical bead 30. The diameter of the latter is preferably .010" or .012" larger than the interior diameter of the neck 13a. The punch 28, as it is driven forceably into the end of the neck 13a, will cause the latter to be flared outwardly and be tightly seated against the larger bend 22a of the bushing 14a and the head 30 of the punch, because of its increased diameter of the interior of the neck 13a, will cause the intermediate portion of the neck to be expanded and forced into the interstices of the knurled surface 19a.

While the form of the invention shown and described herewith embraces a preferred embodiment of the same, as applied to a trap connection, this is merely by way of illustration and the invention is not limited entirely to such devices but may be adapted for other uses and it is to be understood that the construction may be varied as to mechanical details without departing from the spirit of the invention and the scope of what is claimed.

What is claimed is:

1. A connection for a cylindrical chamber having a converging portion terminating in a tubular neck comprising an exterior threaded bushing having an interior stepped groove and a beveled face, the stepped groove designed to accommodate said neck, and a tubular sleeve having a flanged portion integral with its inner end for engaging the interior of said portion and having its opposite end flared outwardly against said beveled face to hold the parts in permanent assembled position.
2. A connection for a cylindrical chamber made of a relatively thin wall shell having a converging portion terminating in a tubular neck, the connection comprising an exterior threaded bushing and an attaching sleeve, said sleeve having a flanged portion integral with its inner end for engaging the interior of said portion, said bushing in its interior formed with an intermediate cylindrical surface, a beveled face immediately thereabove and a stepped grooved recess immediately below, the cylindrical surface designed to tightly embrace the adjacent wall of said sleeve and the recess to receive the neck of said shell, the outer end of said sleeve being flared outwardly in engagement with the beveled face of said bushing.
3. A connection for a cylindrical chamber having a converging end merging into a relatively short tubular neck by a connecting radius portion, the connection comprising an exterior threaded bushing and an attaching sleeve, said sleeve having one end arcuately flared and terminating in

an annular flange perpendicular to the axis of the sleeve, the interior of said bushing being formed with an intermediate cylindrical surface, a beveled surface immediately thereabove and a recess portion therebelow, the latter designed to receive the neck and radius portion of the converging end, the opposite end of said sleeve being flared outwardly against said bevel to hold the parts in permanent assembled position.

4. A connection for a cylindrical chamber having a converging end merging into a relatively short tubular neck by a connecting radius portion, the connection comprising an exterior threaded bushing member and an attaching sleeve, said sleeve having one end arcuately flared and terminating in an annular flange substantially perpendicular to the axis of the sleeve, the interior of said bushing being formed with an intermediate cylindrical surface with a beveled surface immediately thereabove and a recess portion therebelow, the latter designed to receive the neck and radius portion of the converging end, the opposite end of said sleeve flared downwardly against said bevel to hold the parts in permanent assembled position, the radius portion and flared end of the sleeve differing in shape to the extent of leaving a slight clearance between their adjacent walls whereby the upper edge of the perpendicular flange will be assured a better bite into the adjacent wall of converging end upon assembly.

5. A connection for a cylindrical chamber having a converging portion terminating in a tubular neck, the connection comprising a threaded bushing and an attaching sleeve, said sleeve having one end arcuately flared, terminating in an an-

nular flange perpendicular to the axis of the sleeve and presenting an upper sharp circular edge, the interior of said bushing formed with a cylindrical knurled surface and a beveled face at its inner end connected to the adjacent surface of said bushing by relatively sharp angular corners, the end of the tubular neck flanged over the end of said bushing and the adjacent portion expanded radially against said knurled surface as a means of permanent assembly, said flanging and expansion of the neck effected by tools operating in an axial direction so as to cause the assembled parts to be jammed together in such a manner as to have the corners of the bushing embedded into the outer surface of said neck and the upper sharp corner of said flange likewise embedded into the inner surface of said converging portion and thereby effect a leak-proof seal between the connected parts.

6. A trap connection comprising a tubular member having an intermediate shoulder and terminating in a neck portion, a threaded ring bushing adapted to seat upon said shoulder and having an upper bevelled face, the upper end of said neck portion being flared outwardly over said bevelled face as a means of permanent assembly, and the lower inner wall surface of said bushing having a surface contour different from the adjacent supporting surface of said shoulder and merging neck portion, which different surface contour is designed to be embedded into the adjacent surface of said shoulder and neck to effect a liquid proof seal therebetween coincident with the assembly of the bushing to the tubular member.

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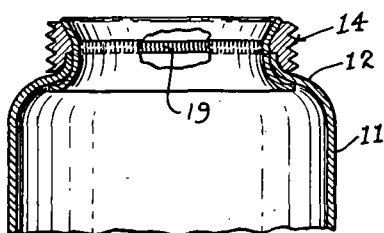
P. F. DONAHUE

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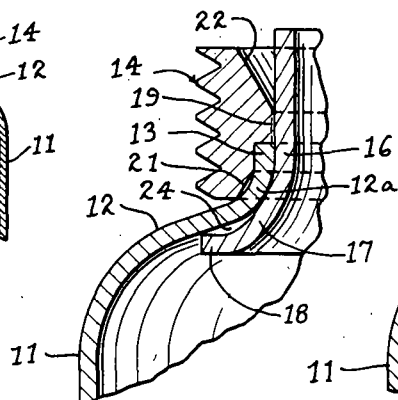
PIPE CONNECTION

Filed May 20, 1938

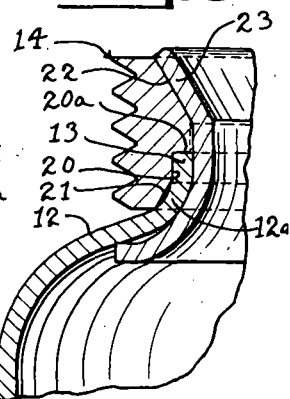
**Fig. 1.**



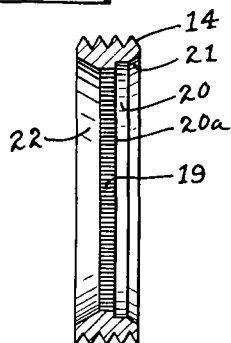
**Fig. 2.**



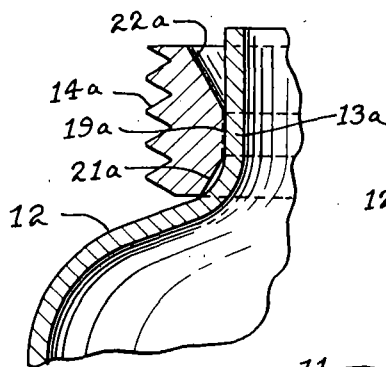
**Fig. 3.**



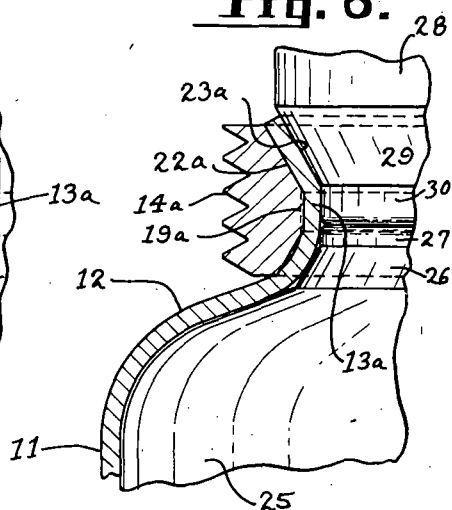
**Fig. 4.**



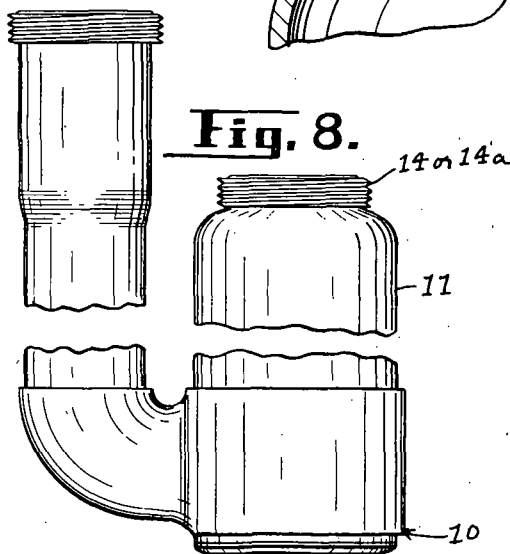
**Fig. 5.**



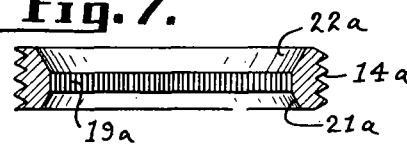
**Fig. 6.**



**Fig. 8.**



**Fig. 7.**



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ATTORNEY

## UNITED STATES PATENT OFFICE

2,165,622

## PIPE CONNECTION

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Application May 20, 1938, Serial No. 209,097

6 Claims. (Cl. 285—56)

This invention relates to pipe connections and particularly to attaching permanently and rigidly a threaded bushing to the end of a relatively thin wall tubular member. The invention is intended primarily for improving the construction of the so-called anti-siphon type of trap wherein there is provided a relatively large cylindrical chamber terminating at its upper end in a reduced neck portion to which is attached a threaded bushing for making connection with a lead-in pipe by means of the usual coupling nut.

It is the principal object of this invention to provide a means for attaching a threaded bushing, having sufficient strength and material to accommodate the standard thread, to the reduced neck portion of the trap without the use of solder, in a leak-proof manner and with sufficient gripping force to prevent relative turning of the connected members after once assembled.

A further object is to design the trap joint end and bushing in such a manner that the assembly may be effected by means of tools that may be operated on a punch press or similar machine; that is, to have the setting tools driven axially into the trap joint in making the assembly.

Other objects and advantages will be apparent from a consideration of the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view through one portion of the upper part of a main container of an anti-siphon trap illustrating the improved manner of attaching a threaded bushing thereto.

Fig. 2 is a vertical sectional view of only one section of the bushing connection drawn on an enlarged scale to more intimately show the details of construction as the parts appear before the setting operation.

Fig. 3 is a similar view showing the construction after the setting operation.

Fig. 4 is a vertical sectional view of the threaded bushing.

Fig. 5 is a fragmentary vertical sectional view of a modified form of construction and somewhat simplified over the first form, the view showing the parts before assembly.

Fig. 6 is a similar view as the parts appear after the setting operation, and showing the tools for performing the setting operation.

Fig. 7 is a vertical sectional view of the bushing used in the modified form of construction.

Fig. 8 is a side elevation, in abbreviated form, of an anti-siphon trap embodying the principle of this invention.

Referring now to the drawing wherein like

numerals refer to like parts throughout the several views: numeral 10 refers generally to an anti-siphon trap, one portion of which consists of a relatively large cylindrical chamber 11, made from a drawn shell, the upper end of which is integrally formed into a more or less restricted or converging portion 12 terminating in a short upstanding neck 13, the latter having its walls parallel to the container axis. Since the chamber part 11 of the trap is made from a drawn shell, the stock thickness of the wall of the neck 13 is not sufficient to accommodate the standard thread employed for making such plumbing connections, thus necessitating the use of a bushing member 14 of sufficient stock thickness to take the standard coupling thread 15 for cooperation with a coupling nut (not shown) usually carried on the other pipe to which the union is made with the anti-siphon trap.

A means is provided for permanently attaching the bushing 14 to the chamber 11 in the form of a cylindrical sleeve 16, the lower part of which is formed into a flaring portion 17 and merges into an annular flange 18 disposed in a plane perpendicular to the axis of the sleeve 16. The interior diameter of the bushing member is constructed so as to provide at its intermediate portion a cylindrical surface 19 capable of having a snug fit around the cylindrical sleeve 16. As shown in Figs. 1 and 4 this surface 19 may be roughened preferably by a straight line knurl to assure a better gripping effect between the adjacent members. Immediately below the surface 19, the bushing 14 is formed with a stepped annular groove 20 and defining a shoulder 20a between the groove 20 and surface 19. The lower part of the groove connects with a small beveled section 21 by a relatively sharp angle joint, while the adjacent portion of the neck 13 merges into the converging portion 12 by a radius portion 12a for reasons which will be later explained. Immediately above the cylindrical wall 19, the bushing is formed with a larger beveled section 22, against which the adjacent walls of the sleeve 16 are formed as at 23 to conform with the bevel 22 and provide a suitable connecting joint face or seat to accommodate the complementary face of the connection member (not shown) in making the trap installation.

In the assembly of the device the bushing 14 is first fitted over the neck 13 of the chamber 11 with said neck engaging snugly within the stepped groove 20 for which the latter was purposely designed. The sleeve 16 is then inserted through the larger end of the chamber 11 to a position

where the perpendicular flange 18 abuts against the inside wall of the converging portion 12 of the chamber 11, in a manner as shown in Fig. 2. By resting the converging portion 12 of the chamber 11 and flange 18 of the attaching sleeve 16 upon a suitable anvil disposed within the chamber 11, another tool of suitable shape may be axially forced into the sleeve from the upper end thereof for the purpose of flaring the wall of such sleeve outwardly against the larger beveled section 22 and swell the intermediate part of the sleeve 16 into the knurled surface 19 to interlock the parts together, and incidentally provide for the connecting joint seat 23, previously mentioned.

It will be noted, by inspecting Figs. 2 and 3, that the connection radius 12a of the converging portion 12 of the chamber 11 is different from the radius or particular form of the flared portion 17 of the sleeve 16 so that when the attaching sleeve 16 is assembled in place the result will be a slight opening or clearance 24 between the adjacent walls of sleeve 16 and radius section 12a. The object of this clearance 24 is to assure, in the assembly operation, that the upper edge of the flange 18 will bite or be forced into the metal material of the converging portion 12. At the same time the relatively sharp angular corners where the small beveled section joins the adjacent walls of the bushing 14 will likewise be forced tightly into the metal of the radius portion 12a and thus assuring a leak-proof and a lock-proof connection between the parts on opposite sides of the wall at the upper end of the chamber 11. This biting effect is caused by the manner of assembly wherein the flange 18 rests upon the suitable anvil and the tool employed for beveling the seat 23 being forced axially into the chamber will necessarily jam all the parts tightly together and at the same time force the wall of the connecting sleeve 16 outwardly to grip into the knurled section 19.

As a practical example, the tools that may be employed for accomplishing the assembly of the parts will be given in connection with the description and drawing of the modified form hereinafter disclosed.

The modified form of construction illustrated in Figs. 5, 6, and 7 differs from the first form in that the connecting sleeve 16 is eliminated and in place thereof the cylindrical neck 13a of the chamber 11 is extended considerably in length, and the upper end thereof is flared outwardly against the larger bevel face 22a of the bushing 14a to produce the connecting joint seat 23a. In this construction the annular groove 20 is omitted from the bushing 14a whereby the intermediate surface 19a is increased in width and, if desired, provided with the straight line knurl as in the first form. The smaller beveled face 21a of the bushing 14a connects into the adjacent base surface of the bushing and the surface 19a by a relatively sharp angle joint for the purpose of biting into the metal surface of the connecting radius section 12b when the bushing 14a is assembled in place.

The purpose of having the connecting angle joint on the opposite sides of the small bevel 21 or 21a bite into the adjacent surface of the radius section 12a or 12b in both forms of the construction is to make the joint leak-proof at that portion so as to prevent solution or acids seeping in between the metal surfaces when such matter might lodge in any interstices therebetween and subsequently leak out to weaken the connection and ruin the finish of the article.

The tools by which the bushing may be secured to the neck of the chamber 11 are shown in Fig. 6. Herein an anvil 25 is employed having its upper end shaped in conformity with the converging portion 12 of the chamber 11. The anvil 25 is surmounted with a frustum-conic neck section 26 terminating in a relatively short cylindrical tip 27 that snugly fits the interior diameter of the neck 13a. The anvil is preferably a stationary member and the chamber 11 with the bushing in the state as shown in Fig. 5 is slipped over the top of the anvil 25 with the converging portion 12 resting on the correspondingly shaped portion of the anvil and the interior high point of the radius section 12b engaging the conic section 26.

The punch 28 for upsetting the metal stock of the neck 13a travels in an axial line common with the axis of the chamber 11. The punch 28 is formed with a conic working face 29 terminating in a reduced cylindrical bead 30. The diameter of the latter is preferably .010" or .012" larger than the interior diameter of the neck 13a. The punch 28, as it is driven forcefully into the end of the neck 13a, will cause the latter to be flared outwardly and be tightly seated against the larger bend 22a of the bushing 14a and the head 30 of the punch, because of its increased diameter of the interior of the neck 13a, will cause the intermediate portion of the neck to be expanded and forced into the interstices of the knurled surface 19a.

While the form of the invention shown and described herewith embraces a preferred embodiment of the same, as applied to a trap connection, this is merely by way of illustration and the invention is not limited entirely to such devices but may be adapted for other uses and it is to be understood that the construction may be varied as to mechanical details without departing from the spirit of the invention and the scope of what is claimed.

What is claimed is:

1. A connection for a cylindrical chamber having a converging portion terminating in a tubular neck comprising an exterior threaded bushing having an interior stepped groove and a beveled face, the stepped groove designed to accommodate said neck, and a tubular sieve having a flanged portion integral with its inner end for engaging the interior of said portion and having its opposite end flared outwardly against said beveled face to hold the parts in permanent assembled position.

2. A connection for a cylindrical chamber made of a relatively thin wall shell having a converging portion terminating in a tubular neck, the connection comprising an exterior threaded bushing and an attaching sleeve, said sleeve having a flanged portion integral with its inner end for engaging the interior of said portion, said bushing in its interior formed with an intermediate cylindrical surface, a beveled face immediately thereabove and a stepped grooved recess immediately below, the cylindrical surface designed to tightly embrace the adjacent wall of said sleeve and the recess to receive the neck of said shell, the outer end of said sleeve being flared outwardly in engagement with the beveled face of said bushing.

3. A connection for a cylindrical chamber having a converging end merging into a relatively short tubular neck by a connecting radius portion, the connection comprising an exterior threaded bushing and an attaching sleeve, said sleeve having one end arcuately flared and terminating in



an annular flange perpendicular to the axis of the sleeve, the interior of said bushing being formed with an intermediate cylindrical surface, a beveled surface immediately thereabove and a recess portion therebelow, the latter designed to receive the neck and radius portion of the converging end, the opposite end of said sleeve being flared outwardly against said bevel to hold the parts in permanent assembled position.

4. A connection for a cylindrical chamber having a converging end merging into a relatively short tubular neck by a connecting radius portion, the connection comprising an exterior threaded bushing member and an attaching sleeve, said sleeve having one end arcuately flared and terminating in an annular flange substantially perpendicular to the axis of the sleeve, the interior of said bushing being formed with an intermediate cylindrical surface with a beveled surface immediately thereabove and a recess portion therebelow, the latter designed to receive the neck and radius portion of the converging end, the opposite end of said sleeve flared downwardly against said bevel to hold the parts in permanent assembled position, the radius portion and flared end of the sleeve differing in shape to the extent of leaving a slight clearance between their adjacent walls whereby the upper edge of the perpendicular flange will be assured a better bite into the adjacent wall of converging end upon assembly.

5. A connection for a cylindrical chamber having a converging portion terminating in a tubular neck, the connection comprising a threaded bushing and an attaching sleeve, said sleeve having one end arcuately flared, terminating in an an-

nular flange perpendicular to the axis of the sleeve and presenting an upper sharp circular edge, the interior of said bushing formed with a cylindrical knurled surface and a beveled face at its inner end connected to the adjacent surface of said bushing by relatively sharp angular corners, the end of the tubular neck flanged over the end of said bushing and the adjacent portion expanded radially against said knurled surface as a means of permanent assembly, said flanging and expansion of the neck effected by tools operating in an axial direction so as to cause the assembled parts to be jammed together in such a manner as to have the corners of the bushing embedded into the outer surface of said neck and the upper sharp corner of said flange likewise embedded into the inner surface of said converging portion and thereby effect a leak-proof seal between the connected parts.

6. A trap connection comprising a tubular member having an intermediate shoulder and terminating in a neck portion, a threaded ring bushing adapted to seat upon said shoulder and having an upper bevelled face, the upper end of said neck portion being flared outwardly over said bevelled face as a means of permanent assembly, and the lower inner wall surface of said bushing having a surface contour different from the adjacent supporting surface of said shoulder and merging neck portion, which different surface contour is designed to be embedded into the adjacent surface of said shoulder and neck to effect a liquid proof seal therebetween coincident with the assembly of the bushing to the tubular member.

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